MANAGEMENTUL SERVICIILOR DE ALIMENTARE CU APĂ POTABILĂ ÎN CONDIŢII DE CRIZĂ

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MANAGEMENT OF DRINKING WATER SERVICES IN CRISIS CONDITIONS

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Abstract
The specialty literature is more and more focused on the satisfaction on tap water. Consequantlly there are increased efforts to provide quality water and to gain the consumer confidence. This effort requires a multidisciplinary approach in order to combine the various technical requirements of consumer perception. This article aims at understanding the processes that contribute to public perception of water quality to maintain or enhance consumer satisfaction and confidence.

***Keywords*:** drinking water, indicators, quality

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Rezumat
In literatura de specialitate se observa o concentrare a atentiei asupra satisfactiei consumatorilor privind apa de la robinet si o sporire a eforturilor pentru a furniza apă care să câştige încrederea consumatorilor. Acest efort presupune o abordare multidisciplinara, pentru a putea imbina cerintele tehnice cu perceptia consumatorilor. Prezentul articol are ca scop intelegerea proceselor care contribuie la formarea perceptiei publice privind calitatea apei pentru a mentine sau imbunatati satisfactia si increderea consumatorilor.

Cuvinte cheie: apa potabila, indicatori, calitate.

1. INTRODUCTION

Water is a primary factor of the conditions of life on Earth, but also is the major factor of comfort.

Quoting from the quality standards of the developed countries, „ water is the most important supply of food". Ultimately the human can lack of water in other uses, but not lack of drinkable water. We can withstand without food fairly a long time, but without water for a very short period of time. Eventhough we find water in almost any aliment, we have this need of liquid water.Therefor the most important for human existence was, is and will be drinkable water.

The water suplies of all the population centers must meet a certain standard, household needs(drinking, cooking, washing, watering green spaces, fountain supply), industrial needs and fire fighting situations.

The constant development of the population centers requires a permanent improvement of the technical procedures, capturing water from natural sources, improving its quality, transporation, storing the water sipplies nearby the consumers location, distributing the wather trough pressured pipes to each point of consumption. Public services are a part oh the whole principles by all the European Union members, and it represents an esential factor of the european model society.

These services form a basis of European society building, as access to them is one of the rights enjoyed by European citizens.

Community services are all public utilities and public utility activities generally performed in the villages, towns, municipalities or counties under the direction, coordination and responsibility of local authorities, in order to meet the needs of local communities, which provides the following utilities: water supply, sewerage and wastewater treatment, collection, sewer and storm drainage, production, transmission, distribution and supply of thermal energy, sanitation localities, public lighting, public and private administration of local governments, local public transport. (Law no.51 of 8 March 2006 public utility community services).

Water and sewerage services are activities of public utility and general economic interest under the authority of local government and aimed at providing drinking water and sanitation services for all users within the area. Water service has both an economic dimension and a social inextricably interrelated. From an economic perspective, the service creates the premises for carrying out the production processes of economic sectors and is a market for a number of finished products from other economic sectors.

From a social perspective, providing water service also offers an important number of jobs for the citizens and at the same time it insures drinking wather, needed in human existance and corporal hygiene for a an important part of the country's population.

The principle of ensuring hygiene and public health draws the attention over the importance of ensuring a certain quality of drinking water.

Therefore water quality monitoring is done in the distribution network, which aims to ensure protection of human health against the effects of any type of contamination of drinking water by applying measures necessary to remedy the water quality or usage restrictions.

There is a need for a periodic provision of information on the organoleptic and microbiological quality of drinking water, that determines if the treatment technology is effective in establishing if drinking water complies with the terms of the values of quality parameters established by law.

To monitor the control necessarily follow the following parameters, as established by law no. 311/2004 amending and supplementing the law on drinking water quality nr.458/2002:

Nr.crt.	Parameter	Value CMA*)	Measurement unit
1.	Aluminium	200	µg/l
2.	Ammonium	0,50	mg/l
3.	Coliforms	0	number/100 ml
4.	Culoare	Acceptable for consumers and no abnormal alteration	
5.	Hydrogen ions concentration (pH)	≥6,5 ; ≤9,5	pH units
6.	Conductivity	2500	µS/cm at 20°C
7.	Free residual chlor	0,50	mg/l
8.	Clostridium perfringers	0	numberr/100 ml
9.	Total hardness, minimum	5	German degrees
10.	Escheria coli (E.coli)	0	100 ml
11.	Enterocytes	0	100 ml
12.	Iron	200	µg/l
13.	Taste	Acceptable for consumers and no abnormal alteration	
14.	Smell	Acceptable for consumers and no abnormal alteration	
15.	Nitrites	0,50	mg/l
16.	Oxidability	5,0	mg O_2/l
17.	Pseudomonas aeruginosa	0	number/250 ml
18.	Sulfures and sulfuric hydrogen	100	µg/l
19.	Turbidity	≤5	UNT
20.	Number of developed colonies (22°C si 37°C)	No abnormal alteration	

*) Maximum concentration

The tracked parameters are grouped in categories of quality:

- microbiological parameters: Escher coli, enterococci;
- chemical parameters: nitrates, lead, chromium, selenium, pesticides, aluminum, etc..;
- indicative parameters: turbidity, hardness, color, coliform bacteria, conductivity, taste, smell,

In the public services of water supply and sewage, the main indicator is the quality of services and it has to be respected. Drinking water should not have a characteristic odor and must have a pleasant taste. Otherwise, water may have contaminants that are harmful to health.

In some countries in Western Europe they are watching 45 indicators on water quality and standards of the European Economic Commission (EEC) approved in 1980, recommends further pursuit of 62 water features. In all developed countries water pollution control is an ongoing concern because water quality contributes to the health of nations.

There are various polutors of water, over 800, from wich very few are monitored.

The quality of water supplied via the drinking water supply may be affected by these factors internal or external

- Chemical and biochemical reactions that take place during the transportation of the water
- Forming secondary products of desinfection;
- training and development of a biological ecosystem;
- chlorine consumption by reducing substances existing in nature water
- reactions between water and the materials constituting the networks;
- tightness defects appeared to joints
- craks of the transportation pipes.

2. SPECIALITY LITERATURE

Currently, there is a concentration of attention on consumer satisfaction on tap water and increased efforts to provide water to gain consumer confidence.

This effort requires a multidisciplinary approach to combine the technical requirements with the consumer's perception. In the end, we need a good understanding of the processes that contributes to public perception of water quality to maintain or improve satisfaction and confidence of the consumer.

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Previous research has revealed several factors that influence consumer perception on drinking water. These include organoleptic properties (especially flavor), perception of risk, previous experience (eg familiarity with a particular type of drinking water), contextual factors on drinking water supply system, the perception of chemicals, trust in companies that provide water, water pressure, personal and interpersonal information obtained through the media or from family members) and some demographic variables.

It was shown that dissatisfaction on the quality of tap water can lead to search for alternative use.The literature abounds with studies on water quality and quality of drinking water supply in the world.In general, in the speciality literature, the main parameters that are studied are:

- physicochemical parametes : Cl^-, Na^+, K^+, Ca^{2+}, Mg^{2+};
- heavy metals content : nickel (Ni), chromium (Cr), cadmium (Cd), copper , lead ;
- Concentraton ofNO_3^-, NO_2^-, NH_4^+, PO_4^{3-}, SO_4^{2-}, $Br^-$and organic carbon;
- "natural pollutants" that dissolve in the water, such as chromium, sulphates, fluorine, bromine.

Substances in the first category are also called nitrates, being very soluble salts some who do not dissolve or transform on soil, so they filter into the groundwater.

They come from fertilizers based on potassium nitrate and ammonium. The existence of ammonium nitrate in drinking water indicates pollution with wastewater (from the sewer system), very dangerous situation for public health.

This form of nitrate nitrogen indicates that previous pollution is no longer a high threat to human health. In addition it was noted that the existing cement mortar sometimes makes pipes to join, and can cause the release of considerable amounts of ammonium in drinking water.

Potassium nitrate come from anthropogenic activities generally performed such as water used for domestic activities rich in detergents, water that were filtered substances fertilization or from animals. Sulfates in water appear generally in situations where water comes in contact with mineral deposits or rock.

Fluoride occurs naturally in water and puts health problems only if its concentration is very high and consumption is long.

Bromine can be found in nature as bromide salts or organic substances, most often associated with sea water or salted lakes .

The existence of organic carbon is a sign that water is polluted with organic substances or natural anthropogenic origin. Usually this situation occurs when surface water is very difficult to eliminate.

The concentration of lead and nickel indicate most cases corrosion of valves and pipe system within the distribution system.

Excess sodium and chlorine, together with high electrical conductivity, water infiltration indicate salt due to excessive pumping. In addition, very important in assessing water quality are the pH, clarity (turbidity), conductivity and temperatureIn terms of pH, its low concentration in groundwater is caused by the presence of carbon dioxide generated in the soil of aerobic or anaerobic microorganisms. As this level is lower, the more the water is acidic.That is why the parameter is used to determine how corosive is the water.

Generally the taste should be more influenced by water pH. However it was found that very low levels waters that contain this parameter received acceptable taste responses from consumers. The explanation lies in the percentage of salts and minerals found in water content that can alter taste perception.

In terms of clarity (turbidity), a high level of it can occur in the context of reducing or increasing inorganic particles in water wells in the form of suspensions. Consumers generally associate this feature with the water and wastewater pollution because their health problems they raise, particularly in urban areas. This type of water usually requires a complex process of disinfection.

Conductivity is affected by the presence of ions dissolved in water. The importance of electrical conductivity is determined by salinity, which generally affect the taste and because of this also the degree to which water is accepted by consumers.

In terms of temperature, it is considered that there is generally a time for this well established, recording large temperature differences depending on the specific environmental conditions. However, a high water temperature is associated with a taste less desirable to consumers.

Temperature influences the other parameters, such as the degree of conductivity. A high level of its activity leads to an acceleration of microorganisms and bacteria, creating favorable conditions for the appearance of odors.

Below is a selection of works that have dealt with this topic and main ideas arising from these works.

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The França Doria, Pidgeon and Hunter (2009) show that there can be used both quantitative and qualitative methods to explore this area. That quantitative methods can be used through questionnaire respondents to show agreement score for a particular feature on a particular scale.

The study was conducted for the UK and Portugal. The questionnaire apllied was regarding information on the following parameters: quality, risk, taste, color, smell, pressure, hardness, lead, chlorine, previous experience, confidence, familiarity, etc..

Following the analysis of the questionnaires it was found that tap water is perceived as having high quality. In both countries there are positive aspects (satisfaction of taste, smell, color, pressure, etc..) which was above average on the scale of assessment, and the negative (risks, negative information from friends or family, too high hardness, chlorine content or lead) is below average. Although the big picture on water quality does not differ significantly in both countries (5.61 and 5.27 in the UK in Portugal on a scale of 1 to 7), the direct consumption of tap water is different.

The vast majority of British respondents (80%) and about half of the Portuguese (46%) said they use tap water as the main source of drinking water. Only 6% of respondents said they drink rarely British tap water, and the proportion was much higher for the Portuguese (24%).

Turgeon, Rodrigues, Theriault and Levallois (2004) Studies suggest that over the distribution network water quality may change. This stands out studying the concentration of chlorine in water.

Chlorine is the most common disinfectant used in drinking water treatment. It is used as a disinfectant during the treatment to disable various types of microorganisms.

Moreover, when the plant uses water requires a certain amount of residual chlorine which acts as a protective response against microorganisms in the travel time distribution network. Chlorine concentration decreases during the movement of water across the system and can even become indistinguishable from network extremities. These extremities are characterized by a high waiting time and a significant degree of "intimacy" between the amount of water and pipes, especially if they have a small diameter.

Reactions between compunds from water and the material thepipes are made, are encouraged, reactions that can lead to deposits of organic and inorganic materials, corrosion of iron pipes and apariria an unwanted biofilm on the inner walls of pipes, especially in summer months . These phenomena, together with low residual chlorine content in water favors microbiological degradation, especially when water temperature is high. Maintaining a sufficiently high level of residual chlorine in water is the best way to reduce the risk of microbiological contamination. However, there are

disadvantages. Chlorine reacts with natural organic matter dissolved in water, generating potential carcinogenic products.

They are found in highest concentrations at the extremities of the network. Moreover, smell or taste problems are commonly cited reasons in complaints of users.

Although the it is treated in the plant , water quality varies throughout the distribution system. Although it follow standards when leaving the factory, several investigations have shown that, in terms of quality (both physicochemical and microbiological), water deteriorates as it moves from treatment plant to consumers.

It was clear that these variations are associated with variation in waiting times of water pipes throughout the distribution system. It is logical therefore to conclude that the perception of water quality will vary spatially in the distribution system.

Vairavamoorthy, Gorantiwar and Pathirana (2008), point out that in some parts of the world, especially in developing countries the need of running water exceeds its capacity of providing and even of the existing water resources in those areas. The main factors contributing to this situation are: climate change, land use necorespunzatoate, pollution, population growth continues and last but not least the process of urbanization.

According to statistics, half of the world population lives in urban areas and according to a study by WHO and UNICEF the number of urban population without access to improved water sources increased from 113 million in 1990 to 173 million in 2000.

Moreover, and Anderson (2006) informs this problem in his work, giving the example of Sydney, where the water supply system is already running at full capacity. A solution is identified in this respect, as the title suggests, recycling water and using it for home gardens or different activities.

The author argues that an integrated system for Sydney water recycling has a number of economic and environmental benefits that can play a key role in providing a solution to Sydney's water needs and government objectives for Hawkesbury-Nepean river system restoration affected by pollution. Zerah (1998) also talks about these issues in his work, citing the situation in Delhi. Here the difference between demand and supply of water can reach up to 700 million liters of water.

Resource deficit is usually the main reason cited by the authorities to explain the output gap, but there are a number of factors that worsen the situation: high percentage of leakage (about 30%), low recovery of losses, high subsidies granted.

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All these factors make only 40% of water supplied by water company in Delhi to be paid and motivated lack of concern with respect to investments in water supply system of the city. Another problem is the quality of water distributed notified, mainly due to poor quality distribution network. Directive 98/83/EC is the latest in terms of European legislation and establishes water quality standards.

Provisions developed by the Directive allows Member States to adapt to local conditions monitoring caliatii water, not only to evaluate the safety to the consumer but also to detect any toxicological nature of the problem and implement appropriate measures to achieve optimum water quality.

Karavoltsos, Sakellari, Mihopoulos and all (2008), in their work aim to assess the quality of drinking water under a specific set of parameters, many of which are mandatory under Directive 98/83/EC, which concerns both the physical properties chemical (pH, electrical conductivity, total amount of solids), but also the chemicals that are related to water treatment, its hardness, heavy metals and ions, dissolved organic carbon.

The methods used for testing water quality were sampling a random time of day from a building area chosen randomly, samples after the pipes have been cleared of stagnant water, samples after 30 minute of stagnation in the pipes. Following analyzes showed high concentrations were found at the following elements: lead and nickel, which in excess contributes to corrosion of pipes valves and distribution system, ammonium, nitrate, sulfate and fluoride, which indicates the presence of excess surface sources of pollution or or groundwater, sodium chloride, which indicate excessive penetration with high conductivity of sea water in connected aquifers because of excessive extraction of water by pumping (this violation of the parameters is found mainly around the islands and near shore) . Subsequently, the authors explain the methods of testing water used for each parameter followed, explaining the limits and the accuracy of measurements.

The results are compared with standards set by the European Union and the regions studied are presented in detail. In conclusion, the causes are identified to be responsible for failure to satisfy the quality requirements of European legislation, such as old system of distribution, specific marine climate, pollution and natural human, insecure supplies. Perard (2009), in his work, trying to find the answer to the question: Water supply - public or private? In member countries of the Organization for Economic Cooperation and Development (OECD), the number of people that rely on private water supplies in the system varies between 200 and 300 million (17-25% of the population states).

However experience in terms of delegating water supply varies from country to country even among OECD countries.

After the number of people served it can be said that the private sector predominates in only five countries of the world, in which only three OECD countries: Chile, Czech Republic, France, Malaysia and England and it is below 10% in 17 of the 30 Member States OECD. The choice between these two systems depends on four aspects: different funding costs, transaction costs of outsourcing, the difference in efficiency, the potential political costs of privatization. In terms of efficiency, most theories consider this aspect in determining privatization decision. State enterprises are considered usually as less efficient than private firms.

Some authors argue that efficiency depends on the private property rights and other authors argue that this is ensured by the combination of three factors: property, competition and regulation.

Thus, in a fully competitive market, private property would be more than eficinta public. Hoko (2008), in his work generally argues that water quality standards are based on two major criteria: the nature of unwanted, unpleasant taste, smell and color and the presence of substances with negative effects on health.

The first criterion can be applied not only to specialists but also by ordinary people, the only problem is their view on the main variation observable aspects: taste, smell, color and other aspects.

This is the aesthetic dimension that water source must fulfill, which is a size parameter of quality because it was found that people refuse to use a source of drinking water and is harmless because of its looks.

From our point of view, it presents a very important content of calcium ions, magnesium ions, chloride and sulfate ions, sodium content and pH and electrical conductivity index for wich the maximum admissible concentration (MAC) is : 100 mg / l As, 50 mg / L mg, 200 mg / L Na, 250 mg / l chloride and sulfate. In conclusion an ideal daily intake water must be rich in calcium and magnesium ions, but low in sodium, chlorides, nitrates and sulfates.

3.WATER IN ROMANIA

In Romania, the water is a specific resource, usable under natural conditions, about 1870 cubic meters / capita / year, which ranks 13th in Europe (the European average of 4,000 cubic meters / capita / year).

The 4864 water courses, with a length of about 78,905 km, is the main water resource of Romania. Approximately 7% of the total length of watercourses fall into classes IV and V of quality (poor and bad ecological status).

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In many geographical areas in the country, groundwater contains high levels of nitrates, because of pollution and fertilizers used in agriculture around large cities is polluted water from wells with organic substances.

- To these are added to reduce water resources used, the effect of climate change that is manifested more strongly in recent years.
- On the other hand, 35% of total population still does not enjoy drinking water distributed by public system and 47% do not receive access to the collection and wastewater treatment.
- To reduce the risk of disease, especially for the rural population, major investments are needed in water supply and sewerage. Also, it requires more stringent control of pollution of water courses in industrial areas, limiting discharge any waste water, along with investments in implementation of wastewater treatment plants in the big conurbations.

4. DRINKING WATER SUPPLY SERVICE IN BUCHAREST

Since 2000 and for a period of 25 years, Apa Nova Bucharest is the concessionaire of water and sewerage services in Bucharest. Apa Nova offers both general and specific services. General services provided are:

- water supply of Bucharest;
- industrial water supply;
- removing waste water, storm water, some water and surface water drains from the territory epuisment and Bucharest. (Www.apabucur.ro - Official site of Apa Nova Bucharest).

Specific services refer to:

- collection, treatment, transport, storage and pumping;
- perform physico-chemical, biological and bacteriological drinking water and sewerageindustry;
- execution of connections and fittings;
- replacement cold water meters;
- Troubleshooting to the public water supply;
- maintenance of public sewerage network;
- washing and cleaning the sewers

- cleaning the sewers and openings;
- repair or replacement of sewers.

Bucharest has a drinking water quality at European level at the lowest price furnixata in Europe.

Although water provided by Apa Nova meets the European standards in terms of quality when it leaves the plants , the great disadvantage regarding the consumer is that society does not assume responsibility for the quality of water that reaches into people's homes.

Under the concession contract, Apa Nova should only provide drinking water to block entry and owners should take care of their pipes (pipes in the capital are used by more than 20 years and of which only 10% meet European standards) .

Moreover, according to statistics of City Hall, the total length of water distribution network, administered by SC Apa Nova SA, is 2756 km. 21.5% of this network has a length of over 60 years and 23% - one of over 25 years. Another factor affecting water quality is that Bucharest is the only European capital which has no wastewater treatment plant. In the same situation are 40 cities in Romania, including those in upstream rivers that supply drinking water capital (Teleajen, Prahova, Dambovita, Ialomita).

Experts warn that half the population is in danger of getting sick. Of the nearly 400 water treatment plants in the country, only 14 works normally. In Dambovita and Arges, for example, get all household waste in the capital. From Argentina, processors take water, purify, then provides population.

Discharge of untreated wastewater in Glina in the Capital is one of the largest sources of pollution in the Danube basin. Authorities say that Bucharest would urgently need a wastewater treatment plant, but construction costs could rise to 250 million euros. However this amount would relieve population of over 500,000 tonnes of waste going into rivers every year: nitrogen, phosphorus, pesticides, detergents, viruses, bacteria and heavy metals.

Posilile diseases are due to nitrates and nitrites. The most vulnerable are children, pregnant women and people with low immunity. Are very vulnerable people in rural areas, using water from wells.

Experts say the water in big cities is increasingly dirty. Many Romanians drink water from the sink, all the food and use it to wash, but still no hurry to act. A report published by the European Commission in 2010 shows that southern Romania in the European Union figures among the areas where groundwater contains high levels of nitrates. Agricultural use of chemical fertilizers and organic nitrates is a major source of water pollution in Europe, these damaging human health.

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Another report, the Romanian Waters National Agency in 2009 shows that, under the Directive on the protection of waters against pollution caused by nitrates from agricultural sources in the years 2004-2007, nitrate vulnerable zones were perimeters of 251 localities in 34 counties and 10 river basins, ie 1,217,147 ha (about 8.2% of the total land area).

The necessity of redefining the vulnerable areas imposed extension of vulnerable zones declared vulnerable areas, including areas potentially vulnerable from 8,2% to 58%, of the country surface. Thus, nationwide, there were 1963 identified localities, representing 137 565 km2 (about 58% of the country).

High nitrogen concentrations are recorded in groundwater located in the plains (the Romanian Plain is Bucharest, Western Plain) and less in the area of the plateau (Plateau of Moldavia and Transylvania hillside depression).The two major sources of nitrogen pollution are constantly washing soil impregnated with oxides of nitrogen by rainfall and water from irrigation and surface water (rivers, lakes) that were discharged waste water loaded with nitrates.

These two sources are added and the use of chemical fertilizers honor on some categories of farmland. I hast also exceeded, especially in the major platforms chemical plants. In addition to agricultural activities, an important contributor to nitrogen pollution and nutrients and agglomerations have not complied in terms of sewerage systems and treatment plants.

It can be concluded that the problems characterizing the water distribution system in Romania, in general, and in Bucharest, in particular, are sources of water pollution, old water infrastructure and administrative difficulties, and how it is perceived water quality reach consumers.

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